Space Weather Forecast

Issued on Sunday, 17 April 2022 at 13:03 Local

This forecast provides a four-day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

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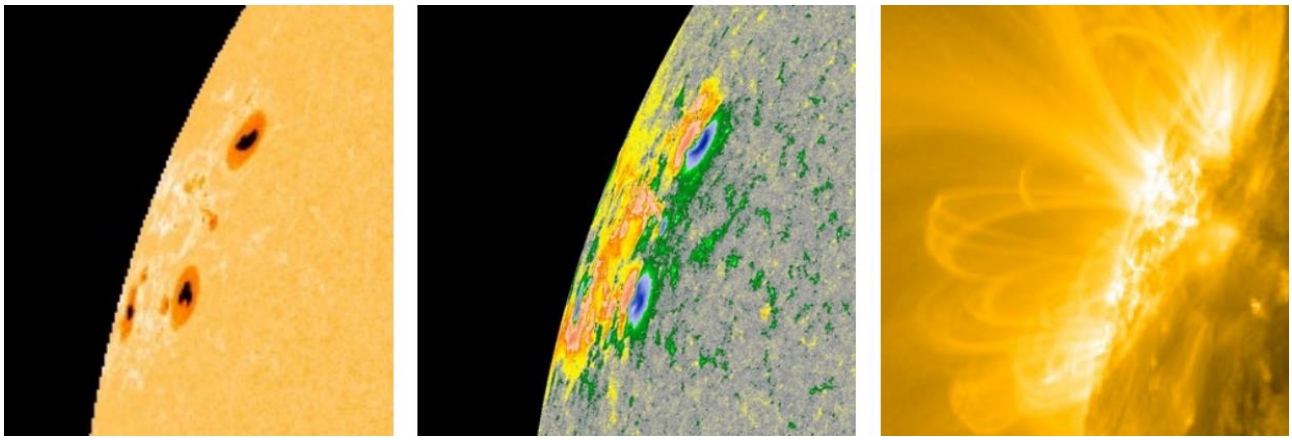
Space Weather Forecast Headline: Moderate-class X-ray flares likely throughout (R1/R2 Radio Blackouts).

Analysis of Space Weather Activity over past 24 hours

Solar Activity: Solar activity became high in the past 24 hours, with a strong X-ray flare observed, peaking at 17/0331UTC. This emanated from a large newly-arrived sunspot in the northeast, near the solar horizon. A moderately fast-moving Coronal Mass Ejection (CME) was in evidence in available imagery, however cursory analysis suggests that this is likely to pass behind the track of the Earth in its orbit to no effect.

Figure 1: View of northeastern solar horizon at 07/1100UTC, showing (from left to right) a visible image of the largest sunspot groups (the one responsible for the strong X-ray fare being the lower cluster); magnetic imagery of the same groups; and finally a proxy for the magnetic field lines emanating from the area in false-colour extreme UV.



There are currently five sunspot groups on the Earth-facing side of the sun, including the aforementioned region. This occupies a particularly busy portion of the sun, which may yet prove still more densely populated when the viewing angle improves, with far-side imagery suggesting further detail may arrive this UTC weekend. To the immediate north of the above sunspot, there is at least one and possibly two groups, hitherto all of which dominate the current disc in terms of areas and magnetic complexity. There were also two other regions of note, one in the southwest, which grew from nothing to a bipolar region by the period's end; while another group near the middle of the sun showed some slight intermediate spot proliferation but maintained its overall character. The final group on the sun was a simple, stable unipolar spot in the southeast.

A possible 'disappearing filament' (arc of plasma on the sun, a possible source of CMEs) was seen just prior to 17/0500UTC from the vicinity of the central sunspot - although any flare from this event was swamped by the declining flux of the earlier strong-class. Imagery will be monitored for any

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ejecta, however there is none in evidence at the time of writing. There were some peripheral CMEs seen in the period, the largest and most notable of which was generated by the aforementioned strong X-ray flare, however at present there are thought to be no Earth-directed CMEs in available imagery.

Solar Wind / Geomagnetic Activity: The solar wind continued to be elevated due to ongoing fast wind influence from a 'coronal hole'. The solar wind speed showed an overall slight decline from elevated to slightly elevated levels in the 24 hours, while both the number of particles and their associated magnetic field were unremarkable.

The net result of the above solar wind measures was mainly quiet, with provisional peak activity observed through the early hours UTC - albeit comfortably below Minor Storm G1.

Energetic Particles / Solar Radiation: No solar radiation storms were observed, with no discernible response from the strong-class flare, perhaps because of its eastward location on the sun.

Four-Day Space Weather Forecast Summary

Solar Activity: Solar activity is likely to be moderate through the period, primarily due to the newly-arrived northeastern active region(s). There is a daily slight chance of further strong-class X-ray flares. No significant groups leave the sun in the four days, however the northeastern solar horizon may yet be bolstered by further arrivals - with detail to follow.

Solar Wind / Geomagnetic Activity: There are no Earth-directed CMEs in the current forecast. Earth is embedded within the fast wind of a small coronal hole at present. Further fast wind enhancements are likely through the period, mainly on days 1-2 (Sunday 17 and Monday 18 April) and then again later in the period, most likely day 4 (Wednesday 20 April). However, confidence is low regarding the strength and timing of these enhancements. There is a daily slight chance of G1/Minor Storms, probably peaking on day 4.

Energetic Particles / Solar Radiation: No solar radiation storms are likely, however there is a slight increase in probability by the end of the period as the largest and most complex regions move westwards across the Earth-facing side of the sun.

Geomagnetic Storms:

Geo-Magnetic Storm Probability (Exceedance)	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Minor or Moderate	G1 to G2	No	5	5	5	20
Strong	G3	No	1	1	1	1
Severe	G4	No	1	1	1	1
Extreme	G5	No	1	1	1	1

Radio Blackouts - X Ray Flares:

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X Ray Flares	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability			(%)	(%)	(%)	(%)
Active	R1-R2 M Class	Yes	70	70	70	70
Very Active	R3 to R5 X	Yes	20	20	20	20

Solar Radiation Storms - (High Energy Protons):

Radiation Storms	Level (cm^{-2} sr^{-1} s^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability (Exceedance)			(%)	(%)	(%)	(%)
Active	≥ S1	No	1	1	2	2
Very Active	≥ S3 *	No	1	1	1	1
* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)						

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